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ABSTRACT

This study assessed the effectiveness of a metacognitive and reciprocal teaching approach for improving the word identification and reading comprehension skills of upper primary poor readers in a regular classroom situation. To improve word identification skills, experimental subjects were given metacognitive training in the analysis and monitoring of word identification strategies. Reciprocal teaching procedures, incorporating the above word identification strategies, were used for comprehension training. Subjects in the experimental condition received the combined metacognitive word identification and reciprocal teaching program. Subjects in two control conditions received either normal classroom word study and comprehension activities or reciprocal teaching of comprehension combined with traditional methods for identifying unfamiliar words. Measures of improvements in word identification, metacognitive awareness and monitoring of word identification strategies, and comprehension were taken on several occasions during the study. Results indicated that a combination of metacognitive word identification strategies and reciprocal teaching of comprehension was clearly more effective than normal classroom word study and comprehension activities or reciprocal teaching of comprehension with traditional methods of word identification. Results also indicated that a classroom-based model of implementation appears to be more successful when teachers have responsibility for its implementation from the beginning. The implications of these findings for classroom practice are discussed, along with the limitations of the study and suggestions for further research. (Contains approximately 150 references, and 6 tables and 5 figures of data.) (Author/RS)

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The Clever Kid's Reading Program: Metacognition and Reciprocal Teaching

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The Clever Kid's Reading Program: Metacognition and Reciprocal Teaching

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This study assessed the effectiveness of a metacognitive and reciprocal teaching approach for improving the word identification and reading comprehension skills of upper primary poor readers in a regular classroom situation. To improve word identification skills, experimental subjects were given metacognitive training in the analysis and monitoring of word identification strategies. Reciprocal teaching procedures, incorporating the above word identification strategies, were used for comprehension training.

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INTRODUCTION

Recent Australian surveys suggest that somewhere between 10% and 20% of primary school children have significant and persistent problems in learning to read (House of Representative Standing Committee on Employment, Education and Training, 1992; Waring, Prior, Sanson, & Smart, 1996). Research indicates that for the majority of these poor readers the basic source of their difficulty is failure to develop accurate and efficient (ie, automatic) word recognition skills (Stanovich, 1986, 1992). In particular, poor readers in the upper primary school, the subjects of this study, are likely to be slow and inaccurate in decoding long, multi-syllabic words, and to rely on context to compensate for their decoding deficiencies (Adams, 1990; Spear-Swerling & Sternberg, 1994; Stanovich, 1986, 1992). Use of context cues however, is also likely to be inefficient because poor word identification may preclude the full accessing of syntactic and semantic patterns in text, especially when reading unfamiliar material in the content areas (Breznitz, 1997; Lewkowicz, 1987; Schatz & Baldwin, 1986; Stanovich, 1986; Yeu & Goetz, 1994). They are also likely to manifest difficulties with transfer and generalisation of learned strategies for decoding words (Moats & Foorman, 1997). Rather, they are likely to rely on only one strategy such as "sounding-out" by letter-sound correspondence (Lewkowicz, 1985; Spiegel, 1985) or to make guesses based on only a few letters (Waring, Prior, Sanson, & Smart, 1996).

Causes of Word Recognition Difficulties

Research indicates at least two possible underlying causal mechanisms for these word recognition problems (Wolf & Bowers, 1999). First, there is a substantial and growing body of evidence that the majority of poor readers experience *phonological processing deficits*, characterised by difficulty in segmenting, analysing, and synthesising speech sounds. Difficulties with phonological processing slow the initial acquisition of spelling-to-sound correspondence skills required for reading in an alphabetic system (eg, Bradley & Bryant, 1983; Byrne, Freebody, & Gates, 1992; Perfetti, 1992; Rack, Snowling, & Olson, 1992; Snider, 1997; Spear-Swerling & Sternberg, 1994; Stanovich, 1986, 1992; Stanovich & Siegel, 1994; Torgesen, Wagner, & Rashotte, 1994; Vellutino, Scanlon, & Spearing, 1995). There is abundant evidence from longitudinal studies that phonologically-based programs, particularly those which stress blending and segmenting skills along with letter-sound correspondence training (Bradley & Bryant, 1983; O'Connor, Jenkins, & Slocum, 1995), can significantly improve the outcomes for most reading-disabled children (eg, Bradley & Bryant, 1983; Solity, Deavers, Kerfoot, Crane, & Cannon, 1999; Tunmer, Chapman, Ryan, & Prochnow, 1998; Torgesen, Alexander, Wagner, Rashotte, Voeller, & Conway, 2001; Uhry & Shepherd, 1997; Vadasy, Jenkins, & Pool, 2000).

However, findings that some poor readers do not respond so well to phonologically-based interventions (Blachman, 1994, Uhry & Shepherd, 1997; Wolf, Bowers, & Biddle, 2000), has led to research into a second possible underlying cause of word recognition reading difficulties. This research has provided increasing evidence that some poor readers experience *visual naming-speed deficits*, either singly or co-existing with phonological processing deficits, ie, a *double-deficit* (Lovett, Steinbach, & Frijters, 2000; Wolf & Bowers, 1999). Visual naming-speed deficits are characterised by difficulty in rapidly accessing and retrieving names for visual symbols, eg, numerals, pictures or letters, even though the names are familiar to the individual (Lovett, Steinbach et al., 2000; Wolf & Bowers, 1999). It has been suggested that deficits in visual naming speed impair children's ability to easily and rapidly make connections between phonemic and orthographic patterns at word and sub-word levels, and hence these individuals have difficulty forming accurate images of sight words in memory and, consequently, are slow to develop fluency and automaticity (Blachman, 1994; Cornwall, 1992; Lovett, Steombach et al., 2000; Manis, Doi, & Bhadha, 2000; Meyer, Wood, Hart, & Felton, 1998; Roberts & Mather, 1997). This research suggests that these individuals need increased amounts of direct instruction and practice in learning orthographic patterns, so as to enable them to move beyond the stage of slowly and laboriously sounding out each letter in a long word, to that of using the natural chunking of sub-word units, eg, onset/rime patterns, syllables, and root word plus affix, which is the hallmark of efficient word recognition processes (Ehri, 1999; Ehri & McCormick, 1998; Juel & Minden-Cupp, 2000; Wolf, Miller, & Donnelly, 2000). This may be especially true for those with a double deficit, who tend to have more severe and pervasive problems than those with only one deficit (Manis et al., 2000; Wolf & Bowers, 1999).

Consequences

Failure to develop a high degree of word recognition fluency during the early primary school years may impact negatively on the development of later reading skills in a number of ways. First, poor decoding skills may place comprehension processes at risk, due in part to the fact that poor readers devote so much attention to the decoding task that there are not enough cognitive resources left for construction of meaning (Näslund, & Samuels, 1992; Stanovich, 1986, 1992). In addition, less-skilled readers often find themselves reading grade-level materials that are too difficult for them, thus degrading the contextual clues which they might

otherwise use to facilitate comprehension of text (Juel, 1988; Stanovich, 1992). Furthermore, children who fail to develop good word recognition skills in the early grades begin to dislike reading and hence avoid reading wherever possible. This lack of practice could delay the development of vocabulary, metalinguistic and syntactic awareness, and general knowledge that are fostered by good reading. This in turn further inhibits growth in reading (Juel, 1988; Muter & Snowling, 1998; Stanovich, 1986, 1992, 1993-1994). In addition, affective and motivational problems resulting from repeated failure experiences can lead to attitudes of "learned helplessness" whereby students attribute their lack of progress to factors beyond their control such as luck or teacher help when they happen to succeed, and low ability or task difficulty when they fail (Borkowski, Carr, Relinger, & Pressley, 1990). These students believe that they will fail regardless of whether or not effort is expended. Consequently they give up trying and so perpetuate the failure cycle (Borkowski et al., 1990; Paris & Winograd, 1990a; Spear-Swerling & Sternberg, 1994).

Metacognition and attribution training

Although the consequences of reading failure at the word recognition, comprehension and motivational levels suggest a poor prognosis, especially after a number of years of failure (Juel, 1988; Prior, Sanson, Smart, & Oberklaid, 1995; Stanovich, 1992; Waring et al., 1996), there are also some positive implications for educational practice. This may be particularly so in the area of metacognitive functioning, ie, in awareness and regulation of appropriate strategies for identifying unfamiliar words (Lovett, Lacerenza, & Borden, 2000; Spedding & Chan, 1993, 1994; Stanovich, 1986, Tunmer, Herriman, & Nesdale, 1988). In particular research by Spedding and Chan (1993, 1994) confirmed that Year 5 poor readers' problems with word identification may reflect deficiencies in the metacognitive abilities that underlie this skill. Poor readers of this age group were found to be inferior in metacognitive abilities involving the use of orthographic cues, morphological cues and context cues. Poor readers were less strategic than average readers in using these cues and were often unaware of the strategies they did use, which would suggest that a training program for upper primary poor readers should include metacognitive instruction in the strategic and flexible use of a variety of word identification cues. However, while metacognitive research (both laboratory and classroom-based) has provided valuable insights in to effective methods for improving the comprehension of poor readers (eg, Billingsley & Wildman, 1990; Bruce & Chan, 1991; Garner, 1992; O'shea & O'Shea, 1994; Palincsar & Brown, 1984; Pressley, Brown, El-Dinary, & Afflerbach, 1995; Swanson & De La Paz, 1998), there has been little parallel research into metacognitive approaches to teaching word identification skills to children with reading problems (Calfee & Drum, 1986; Spedding & Chan, 1994), and the authors of a number of the successful metacognitive training programs stress that they are designed for students who are adequate decoders but poor comprehenders (Englert, Tarrant, Mariage, & Oxer, 1994; Palincsar, 1987; Pressley, Johnson, & Symons, 1987). An effective instructional program for poor readers may thus need to include metacognitive training in appropriate strategies for identifying unfamiliar words, as well as use of metacognitive strategies for developing comprehension skills.

The development of a metacognitive approach however must also take into account the affective and motivational problems mentioned above in order to ensure maintenance and generalisation of learned strategies. Even if students are taught how, when, where and why to use effective strategies, they may not activate them because of negative perceptions about self-efficacy, or an attitude of learned helplessness (Gaskins, 1998; Paris & Winograd, 1990a; Wong, 1991). As a consequence, metacognitive techniques should be included in both specific strategy training and motivational/ attributional retraining so that poor readers can learn to attribute their success and failure to factors within their personal control (Fulk & Mastropieri, 1990; Fulk & Montgomery-Grymes, 1994; Turner, Dofny, & Dutka, 1994).

However, there is evidence that attributional training which focuses solely on effort may be potentially negative for students experiencing difficulties in learning, particularly if they have not developed efficient strategies and they find themselves failing in spite of increased effort (Chan, 1994; Fulk & Mastropieri, 1990; Fulk & Montgomery-Grymes, 1992). Rather, research suggests that attributional retraining is most effective when the focus is on attributing successes and failures to both increased effort and the use or non-use of effective strategies (Borkowski et al., 1990; Borkowski & Muthukrishna, 1992; Chan, 1993, 1994; Fulk & Mastropieri, 1990; Fulk & Montgomery-Grymes, 1992; Turner, Dofney, & Durka, 1994).

Central to the notion of helping children develop the metacognitive insights necessary for the conscious control of both "skill and will" (Paris & Winograd, 1990a), is the notion of "scaffolded instruction", i.e., a process whereby the expert adult provides novices with enough support and guidance to achieve goals that are beyond their personal skill level. This support is provided until they can match the performance of the expert adult (Brown & Palincsar, 1989; Palincsar, 1986; Rosenshine & Meister, 1992; Winn, 1994). Critical to the success of scaffolded instruction is the role of dialogue, whereby teachers engage their students in collaborative communication to help develop a shared understanding of the mental processes associated with the to-be-learned strategies. Teachers also use student responses to diagnose the sources of problems and spontaneously generate additional explanations and elaborations as needed until independent application of the strategies is achieved (Brown & Palincsar, 1989; Englert, Rozendal, & Mariage,1994; Palincsar, 1986; Palincsar & Klenk, 1992; Paris & Winograd, 1990a; Rosenshine & Meister, 1992; Winn, 1994).

Reciprocal teaching

Reciprocal teaching (Palincsar & Brown, 1984), emphasises interactive communication which is the hallmark of scaffolded instruction. Reciprocal teaching has been characterised as "a dialogue between teachers and students for the purpose of jointly constructing the meaning of text" (Palincsar, 1986, p. 119). The dialogue is structured by the use of four strategies that represent the text engagement experienced by successful readers: (1), *predicting*, (2) *clarifying*, (3) *question generating*, and (4) *summarising* (Palincsar, 1987; Palincsar & Brown, 1984, 1986).

In reciprocal teaching the teacher initially models and explains how to use the four strategies, together with providing information about their importance and the context in which they are useful. After the initial days of instruction, students are asked to take turns being *teacher* by leading the text dialogue for one segment at a time, while the teacher provides feedback and coaching as necessary. The dialogue acts as a scaffold - a temporary and adjustable support to instruction, allowing the teacher to adjust instruction to the students' individual needs and to gradually withdraw support as the students acquire and refine the strategies being learned (Brown & Palincsar, 1989; Palincsar, 1987; Palincsar & Brown, 1986, 1988, 1989; Palincsar & Klenk, 1992).

A growing body of research studies has confirmed the effectiveness of reciprocal teaching techniques for improving reading comprehension scores (eg, Bruce & Chan, 1991; Carter, 1997; Hart & Speece, 1998; Kelly, Moore, & Tuck, 1994; Kligner & Vaughn, 1996; Lederer, 2000). Moreover, reciprocal teaching has been found to be effective across a variety of adaptations to suit particular classroom or school-based needs. Reported adaptations include the following: (i) the use of varying numbers of comprehension-fostering strategies (from 2 to 10) during reciprocal teaching (Kligner & Vaughn, 1996; Rosenshine & Meister, 1994); (ii) the combination of reciprocal teaching with other programs, eg, behaviour

modification program to improve student behaviour (Speece, MacDonald, Kilsheimer, & Krist, 1997) or transenvironmental programming to promote transfer of learning across settings (Bruce & Chan, 1991); and (iii) the merging of reciprocal teaching procedures with strategies designed to promote critical thinking and improve the quality of the dialogue (Coley, De Pinto, Craig, & Gardner, 1993). It has also proved highly motivating for many low-achieving students who had previously participated reluctantly, or even actively resisted participating, in teacher-dominated, worksheet-based forms of remedial instruction. In particular, it has been observed that these students enjoy the opportunity to be *teacher* during the reciprocal teaching dialogue and take their role seriously (Coley et al., 1993; Palincsar, 1987; Palincsar & Klenk, 1992; Speece et al., 1997).

With all of these adaptations to the original reciprocal teaching format, the critical factors for successful instruction appear to be the role of the dialogue and the quality of the scaffolding provided. These factors enable students to practise and internalise specific comprehension-fostering strategies in a socially interactive environment, and in the context of reading meaningful materials (Brown & Palincsar, 1989; Palincsar & Brown, 1988; Palincsar & Klenk, 1992; Rosenshine & Meister, 1994).

One criticism of the original reciprocal teaching program is that it is designed for students who are adequate decoders but poor comprehenders (Palincsar & Brown, 1984), and thus may not be entirely effective for the many poor readers who have inadequate word attack skills (Kligner & Vaughn, 1996; Moore, 1988; Rosenshine & Meister, 1994). Recent research studies have sought to address the problem of poor decoding skills by techniques such as: (i) the teacher reading the passage orally to students, or supplying unknown words when students are reading (Speece et al., 1997); (ii) the use of easy text (Marks, Pressley, Coley, Craig, Gardner, De Pinto, & Rose, 1993; Speece et al., 1997); and (iii) rewriting of classroom instructional materials at the poor readers' instructional reading level (Bruce & Chan, 1991). Comprehension gains were reported for each of these studies. However, no specific instruction in overcoming decoding problems was provided, and hence the students would presumably continue to encounter difficulties in comprehension of grade level materials when not receiving support for their decoding problems. An effective instructional program for upper primary poor readers may thus need to include training in appropriate strategies for identifying unfamiliar words, prior to using reciprocal teaching procedures for improving comprehension of written text.

One method for improving word recognition ability suggested by Moore (1988) could be the teaching of word identification strategies though reciprocal teaching. Reciprocal teaching can be readily adapted to accommodate additional strategies and purposes, as indicated above. It may be possible, therefore, to use the reciprocal teaching format to help students learn appropriate strategies for identifying unfamiliar words prior to, or as part of, a program involving reciprocal teaching procedures for improving reading comprehension.

Purpose Of This Study

A growing body of research evidence has highlighted the value of direct and systematic instruction for improving word identification, which may lead to improved reading comprehension by allowing attention to be directed to meaning and not word recognition (e.g., Adams, 1990; Adams & Bruck, 1995; Beck & Juel, 1995; Breznitz, 1997; Ehri, 1992; Homan, Klesius, & Hite, 1993; Markell & Deno, 1997; McCormick & Becker, 1996; Perfetti, 1991;Spear-Swerling & Sternberg, 1994; Tan & Nicholson, 1997). While a literature search revealed numerous cognitive training programs targeting one or more of these word identification strategies (e.g., Algozzine, Lockavith, & Audette, 1997; Bateman, 1991; Felton, 1993; Gunning, 1995; Henry, 1993; Lapp & Flood, 1997; Oldrieve, 1997; Shany & Biemiller,

1995; Tan & Nicholson, 1997), relatively few appeared to employ a metacognitive approach for training students in the thoughtful and flexible use of these strategies or a metacognitive approach for attribution training. Of those metacognitive programs that were found (eg, Allen, 1998; Gaskins, Ehri, Cress, O'Hara, & Donnelly, 1996-1997; Lenz & Hughes, 1990; Lovett, Lacerenza, & Borden, 2000; Spiegel, 1985; Thompson & Taymans, 1994; Wolf, Miller et al., 2000), none specifically targeted the upper primary age group in the regular classroom.

The general purpose of this research was therefore was two-fold: (1) to design and examine the effectiveness of a metacognitive training program, based on reciprocal teaching procedures, which uses an interactive, scaffolding instructional approach and attributional training for improving the word identification and reading comprehension skills of upper primary students with reading difficulties; and (2) to explore effective and efficient ways of implementing a program of this kind in the classroom setting.

With regard to the first general research question, ie, the effectiveness of the proposed metacognitive program, the study focused on the following three specific research questions:

a. To what extent will a metacognitive word identification program improve the metacognitive abilities in word identification and the word recognition skills of a group of upper primary poor readers?

b. How does the effectiveness of a metacognitive approach to teaching word identification skills compare with the effectiveness of a traditional approach to teaching unfamiliar words (i.e., supplying and pronouncing the word), to a group of upper primary poor readers?

c. How does a program involving a metacognitive approach to teaching word identification skills followed by reciprocal teaching of comprehension skills, compare with a program focusing only on reciprocal teaching of comprehension and using the traditional approach to identifying unfamiliar words?

With regard to the second general purpose of the study, ie, exploring the best method for training and supporting regular class teachers to implement such a metacognitive training program for poor readers in a regular classroom setting, this study sought to explore a number of issues for the implementation of the program, which arose out of a previous study (Bruce & Robinson, 2000), namely:

a. *To assess the effectiveness of a model in which teachers assumed responsibility for instruction from the beginning of the study.* This was in contrast to a previous study (Bruce & Robinson, 2000), in which the first author set up the program for the poor readers in each classroom, and then gradually ceded responsibility for the implementation of the program to the class teachers. The previous model was found to be less successful in the teacher-implemented phases as the teachers apparently *ownership* of the program. Prior to the commencement of the program in the present study the teachers were provided with a detailed teacher's guide and the procedures were explained and modelled for them. They were then asked to implement the program as it best suited their regular classroom structure. Regular monitoring by the experimenter was faded as it was ascertained that the teachers or their assistants were following the procedures correctly.

b. *To examine the effects of class teacher training of only the poor readers in the classroom.* In the previous study (Bruce & Robinson, 2000) normally-achieving

readers were included in the training procedures as it was felt that the combination of group support, shared expertise and role models which they provided in the reciprocal teaching dialogue would facilitate the use of these strategies by the poor readers (Brown & Palincsar, 1989; Palincsar & Brown, 1988; Palincsar, David, Winn, & Stevens, 1991). Most teachers in this previous study found it easier to cater for all class members by conducting whole class rather than small group sessions. It was observed however, that the poor readers were often overshadowed by their more dominant normally-achieving peers, especially in whole class lessons, and therefore had less opportunity for participation in the interactive dialogue. Also, in the whole class situation, some teachers tended to control the dialogue rather than allowing pupils to develop in their role as 'teacher'. As a consequence in the present study only poor readers were involved in the teaching sessions.

c. *To assess methods of creating interest in the metacognitive word identification segment of the program.* It had been observed in the previous study (Bruce & Robinson, 2000) that many students lost interest after several weeks of metacognitive word identification activities and it was not until the reciprocal teaching of comprehension segment was introduced that their interest was reactivated. For this reason it was decided to introduce reciprocal teaching of comprehension skills in a modified form in the first teaching phase along with initial instruction in metacognitive word identification strategies.

There were three experimental conditions in this study. **Condition One** addressed reciprocal teaching of word identification. Teachers in Condition One taught both the metacognitive word identification strategies and reciprocal teaching of comprehension procedures during the first phase of the study. The emphasis was on word identification strategies (two days a week), with the third day being spent on a modified reciprocal teaching format, which involved asking questions and making a summary of the passage. During the second and third training phases, teachers concentrated on reciprocal teaching of comprehension while still incorporating the word identification strategies.

Condition Two more specifically addressed the question of the feasibility of reciprocal teaching of comprehension in a regular class situation. Teachers in Condition Two used traditional word identification and comprehension lessons in phase one, changing to reciprocal teaching of comprehension along with traditional methods of word identification in phases two and three.

Condition Three acted as a control group. Teachers in Condition Three used reciprocal teaching of comprehension procedures along with traditional methods for teaching unfamiliar words throughout each phase of the study.

METHOD

Subjects

The subjects were 74 poor readers selected from fourteen Year 5 and Year 6 classes in five public schools in a semi-urban area of NSW, Australia. Poor readers were defined as those having a discrepancy of 18 months or more between their chronological ages and their word recognition reading ages. Students who met the discrepancy criterion, but who had an identified intellectual or sensory disability, or whose reading deficit was due to learning English as a second language, were excluded from the sample.

In asking teachers to cater for only their poor readers, they were given the choice of either conducting the training sessions themselves while the rest of the class worked on independent reading activities, or arranging for a resource person or teacher's aide to conduct the sessions.

The poor readers were divided by classroom into three experimental conditions of approximately equal numbers and with approximately the same mean and range of word recognition reading ages and comprehension percentile rank scores. Additional considerations taken into account when allocating classrooms to the various conditions were as follows: (i) teachers from the same school were placed in the same experimental condition, so that they were unaware of the different procedures used in the other experimental conditions; (ii) classroom groups were allocated so that there were approximately equal numbers of Year 5 and Year 6 subjects in each experimental condition.

Characteristics of subjects in each of the experimental conditions as they were finally organised are presented in Table 1, below.

Table 1

Descriptive Statistics of the Subjects in the Three Experimental Conditions

	Condition 1 (N=25)	Condition 2 (N=27)	Condition 3 (N=22)
Chronological age (in months)			
Mean	133.00	129.70	133.63
Range	126-139	115-144	118-144
St Lucia word recognition reading age (in months)			
Mean	104.28	103.76	104.80
Range	89-121	79-120	77-126
Discrepancy between chronological age and reading age (in months)			
Mean	28.72	25.94	28.83
Range	18-47	18-51	18-53
Comprehension (PAT percentile rank)			
Mean	26.60	26.22	24.91
Range	1-50	1-64	1-60
Sex ratio (boys to girls)			
	10-15	15-12	9-13
Ratio of Year 5 to Year 6 subjects			
	8:17	20:7	7:15

Experimental Design

An Instructional Type (3) x Year (2) x Testing Occasion (4) repeated measures design was employed, with testing occasions being the within-subject factor. Testing took place prior to the commencement of the program (pre-test) and at the end of each of the first two eight-week training phases (mid-test and post-test, respectively) and four weeks after the end of the final eight-week maintenance phase (post-test), as depicted in Figure 1 below

Figure 1

A schema of the experimental design

	Pre-test	Phase One Training Phase One	Mid-test	Phase Two Training Phase Two	Post-test	Phase Three Maintenance Phase	Maint-test
Condition 1		Metacognitive instruction in word identification 2 x 30 mins per week Reciprocal teaching of comprehension strategies 1 x 30 mins per week		Reciprocal teaching of comprehension strategies (including use of metacognitive word identification strategies) 3 x 30 mins per week		Continue with program 2 x 30 mins per week	
Condition 2		Normal word study 2 x 30 mins per week Normal comprehension activities 1 x 30 mins per week		Reciprocal teaching of comprehension skills (with traditional methods of word identification) 3 x 30 mins per week		Continue with program 2 x 30 mins per week	
Condition 3		Reciprocal teaching of comprehension strategies (with traditional methods of word identification) 3 x 30 mins per week		Reciprocal teaching of comprehension skills (with traditional methods of word identification) 3 x 30 mins per week		Continue with program 2 x 30 mins per week	
Weeks Involved	3	8	2	8	2	8	2

Instruction was undertaken by either: (i) the class teacher (seven classrooms in two different schools); (ii) a teacher's aide in cooperation with the class teacher (two classrooms in two different schools); or (iii) the remedial resource teacher in cooperation with the class teacher (five classrooms from the fifth school). Subsequent analysis of the results did not reveal any significant differences in scores between the three types of teaching situations.

In those classrooms where the class teacher was the main implementer, instruction took place in a corner of the classroom while the normally-achieving readers worked on independent reading activities. Where a teacher's aide or resource teacher was the main implementer the poor readers were withdrawn to a quiet area outside the classroom where distractions would be at a minimum, or to the remedial resource room.

Measures

The subjects were administered a number of individual and group tests on each of the four testing occasions designed to measure several aspects of reading and motivation. Individual testing was administered by the same independent person who had no knowledge of group status of subjects. The assessment instruments used are described below.

1. *St Lucia Graded Word Reading Test* (Andrews, 1973) was used to measure accuracy of word identification. It is an untimed, individually administered test consisting of one hundred words, graded in difficulty. Test-retest reliability has been calculated at r=+.947 (Andrews, 1973).

2. *Metacognitive Abilities in Word Identification* (Spedding & Chan, 1993, 1994), which is an individually administered test designed to assess metacognitive abilities in the knowledge and regulation of phonic, orthographic, morphological and context cues in word identification. Each of the four tasks in this test requires students to respond by using a specific word identification strategy.

3. *The Progressive Achievement Test (PAT) in Reading Comprehension* (Reid & Elley, 1988) is a timed, standardised group test of silent reading. The test consists of a series of prose passages approximately two hundred to three hundred words in length, and graded in complexity from easy to hard. Following each passage there are multiple-choice items designed to measure both factual and inferential comprehension. A different form of the test was used on each testing occasion. Reliability of the tests, reported in terms of KR-20 reliability coefficients, ranged from .87 to .90. Correlation coefficients between both forms of the reading test and other reading tests range from .65 to .89.

4. *The Student's Perception of Ability Scale (SPAS)* (Boersma & Chapman, 1978; Chapman & Boersma, 1979) was used as a measure of changes in student academic self-concept. The scale contains 70 forced-choice "Yes-No" items selected from the five major primary school academic areas (reading, spelling, language, arts, maths, and handwriting). Chronbach's alpha was reported as .914, while test-retest reliability over a 4 to 6 week period was reported as .834 (Boersma & Chapman, 1978). Scores on the SPAS also corresponded moderately with end-of-year grade point average ($r = .489$, $p<.001$, $N = 630$). The SPAS was also clearly able to discriminate between normally-achieving students and those with learning problems, and it appeared to be sensitive to changes in academic self-concept resulting from remedial intervention (Chapman & Boersma, 1979).

All subjects were tested on all measures on each of the four testing occasions of pre-test, mid-test, post-test and maintenance test, as outlined in the experimental design in Figure 1.

The Training Program

Student Instructional Materials consisted of a total of 30 short passages (173-387 words in length) written at the Grade 4 to Grade 5 readability level, as determined by the Rix readability formula (Anderson, 1983). The passages were adapted from reading kits and library books in common use in schools and contained factual information in narrative or descriptive form. Each of the passages was structured to target a particular word identification strategy. For example, a passage might contain a number of multisyllabic words requiring students to make use of morphological and structural cues. Each passage was accompanied by a short answer comprehension test consisting of eight questions. The questions were designed to probe both factual and inferential comprehension of text.

The materials were compiled into two booklets, each containing 15 passages, along with accompanying cartoon illustrations and question sheets. The booklets for subjects in Condition One (who were taught the metacognitive word identification strategies) also contained lists of the targeted words for each passage, as well as other words which could be decoded using the same strategy/ies.

Training of pupils.

Condition One: The Clever Kid's Reading Program (used in Condition One) was designed to use a reciprocal teaching format as developed by Palincsar and Brown (1984), for not only teaching comprehension strategies (ie, prediction, clarification, question generation, and summarisation), but also improving word identification strategies. To improve word identification skills, subjects were trained in the use of the Clever Kid's Cues: *Consider the context*; *Compare with known words*; and *Carve up the word parts*. To help monitor and control the use of these strategies, subjects were taught to use the Clever Kid's Motto: *Look for the Cues; Be flexible*; and *Ask: Does it make sense*?

A scaffolded instructional approach was used in which students were engaged in a number of activities designed to help them become familiar with the use of the strategies, and to incorporate the targeted words into their automatic sight vocabulary. First, children were asked to read the title and predict what the passage might be about, thus cuing them into possible vocabulary to look for in the text. Then the teacher modelled and explained the particular strategy being targeted in the passage, eg, the passage might contain a number of multi-syllable words requiring children to *Carve up the Word Parts*, or a number of words containing the 'tion' spelling pattern, requiring them to *Compare with Known Words*. Students were encouraged to use the *Consider the Context* strategy to confirm or deny whether the word selected by using the other two strategies made sense in that sentence. Every time an unfamiliar word was encountered, the group was encouraged to work collaboratively in using the Clever Kids' Motto and Cues to identify the word, while the teacher provided guided feedback and coaching as necessary. During the second session children played flashcard games with the targeted words, and practised reading the passage either individually or in pairs, in preparation for a "one-minute-reading test" in which they endeavoured to see how many words they could read fluently in the given time. During the third session students were trained in a modified form of reciprocal teaching of comprehension strategies, which involved asking questions and making a summary of the passage. For comprehension testing, the subjects wrote short answers from recall to the eight orally presented comprehension questions which accompany each passage. Every opportunity was taken to provide attributional training, so as to encourage students to attribute their success (or lack of it), to factors within their control, such as effort and efficient (or inefficient) use of strategies.

During phases two and three of the program, teachers concentrated on reciprocal teaching of comprehension while still incorporating the word identification strategies.

Conditions Two and Three: Teachers in Condition Two used traditional word identification and comprehension lessons in phase one, changing to reciprocal teaching of comprehension along with traditional methods of word identification in phases two and three. Teachers in Condition Three used reciprocal teaching of comprehension procedures along with traditional methods for teaching unfamiliar words throughout each phase of the study. Subjects were involved in the same 8-question comprehension testing procedures and the same attributional training procedures as described above for subjects in Condition One.

The traditional method of word study, used in Conditions Two and Three, consisted of writing difficult words from the instructional passage on the board and asking pupils to pronounce each word and give its meaning, while traditional comprehension activities involved the use of regular comprehension work-book type activities.

Instruction took place on three 30-minute sessions per week during training phases one and two, and two 30-minute training sessions per week, during training phase three, which was a maintenance phase. In general, one passage was studied per week.

By the end of the third instructional phase, all classes had completed the first booklet (15 passages), and were part way through the second booklet, although some were further advanced than others. No class completed all 30 passages. No teacher claimed to use instructional materials other than those developed by the experimenter.

Teacher Instructional Materials: Teacher's guide booklets were prepared, outlining the procedures to be followed. The booklet for teachers in Condition One contained instructions in both metacognitive word identification procedures and reciprocal teaching of comprehension procedures. Teachers in Conditions Two and Three were given booklets containing only the reciprocal teaching of comprehension procedures.

To provide additional assistance, laminated wall charts appropriate to the intervention they were undertaking were prepared for each teacher (i.e., Clever Kid's Cues, Clever Kid's Motto, and Reciprocal Teaching procedures for Condition One, and Reciprocal Teaching procedures only for Conditions Two and Three). The same charts were included in the pupil's workbooks. In addition, sets of flashcards containing the targeted words for each passage were prepared for teachers in Condition One.

Two videos containing instructional sequences were prepared for teacher viewing. The video shown to teachers in Condition One showed both metacognitive instruction in word identification procedures and reciprocal teaching of comprehension procedures. The video for teachers in Conditions Two and Three showed reciprocal teaching of comprehension procedures only.

Training of teachers (or teacher's aides/resource teachers) occurred in a number of stages. First, approximately 30 to 45 minutes was spent with each teacher explaining the procedures, viewing the video, and introducing the teacher's guide books and the pupil's instructional books. In some cases teachers kept the video overnight to view again at their leisure. After the teachers had been given one or two days to study the teacher's guidebooks and think through their instructional role, they were again contacted to see whether there were any further questions or issues that needed clarifying. Decisions were then made as to when, where and by whom instruction would be carried out.

The next step was for the experimenter to teach the introductory lessons in each classroom while the teacher and (where applicable) resource teacher or teacher's aide observed. The first lesson was taught to the whole class so that the normally-achieving readers would have some understanding of what would be happening in the special reading group, and what the wall charts meant (Clever Kid's Motto and Cues and Reciprocal Teaching for Condition One and Reciprocal Teaching for Conditions Two and Three). This was done with the aim of minimising any stigma which might be attached to the poor reader group, by showing the normally-achieving students that the poor reader group were going to be involved in some interesting and fun activities. The second lesson was taught by the experimenter to the poor reader group in each classroom, and provided further opportunity for modelling and explanation of the procedures for the teacher or teacher's aide.

The next two or three lessons (week two of the intervention) were taught by the teacher or aide/resource teacher while the experimenter observed and provided feedback and coaching as necessary. Thereafter, during Training Phases One and Two, the experimenter visited each poor reader group weekly to ascertain that the procedures were being followed correctly and to help correct any problems which may have arisen.

During Training Phase Three, the teachers and aides continued with instruction for two days per week. During this time input from the experimenter was minimal.

RESULTS

Each of the three experimental conditions in this study was analysed using a separate Group (2) x Year (2) x Testing Occasion (4) repeated measures design. This analysis was conducted for each measure of reading used in the study, as well as for the self-perception of ability scale. These analyses compared results from Conditions One and Two, Conditions One and Three, and Conditions Two and Three, respectively. Year level was found to be a significant factor only for the Metacognitive Abilities in Word Identification measure, and even then the results were inconsistent, possibly due to the small numbers in some of the class groups. For these reasons a second analysis was made for all measures using only Group and Testing Occasion. Sample sizes for the variables may differ because of student absences during some testing occasions or because of missing data in some of the scales. Table 2 contains the group means and standard deviations of all the measures.

Table 2
Means And Standard Deviations Of The Dependent Measures for the Three Experimental Conditions

Condition One	Condition Two		Condition Three			
	Mean	SD	Mean	SD	Mean	SD
St Lucia						
Pre-test	40.13	6.77	39.04	7.81	40.00	12.37
Mid-test	47.25	9.16	43.08	8.58	44.40	13.24
Post-test	50.63	9.91	45.52	8.66	47.00	13.31
Maintenance Test	57.46	10.64	50.20	8.98	53.30	13.63
Metacognitive Abilities in Word Identification Use of Cues						
Phonic						
Pre-test	2.88	1.66	2.93	1.83	3.68	2.06
Mid-test	3.00	1.50	2.77	1.93	3.32	1.89
Post-test	4.04	1.24	3.62	1.77	4.00	1.38
Maintenance Test	4.76	1.20	4.04	1.69	4.27	1.42
Orthographic						
Pre-test	4.96	0.84	4.42	1.50	4.41	1.40
Mid-test	5.04	1.14	4.81	1.31	4.41	1.53
Post-test	5.12	1.17	4.92	1.38	4.86	0.94
Maintenance Test	5.04	1.37	4.96	1.37	5.27	1.03
Morphological						
Pre-test	3.80	1.58	2.81	1.52	3.05	1.59
Mid-test	3.72	1.43	3.27	1.56	2.59	1.62
Post-test	4.68	1.15	4.12	1.75	3.86	1.61
Maintenance Test	4.36	1.38	3.96	1.46	3.18	1.14
Context						
Pre-test	4.16	1.11	3.62	1.33	4.05	1.05
Mid-test	4.96	0.89	4.35	1.23	4.18	1.20
Post-test	5.64	0.64	5.08	1.35	5.32	1.00
Maintenance Test	5.80	0.58	5.77	0.51	5.77	0.61
PAT Comprehension Percentile						
Pre-test	27.67	15.04	26.22	17.58	24.91	16.81
Mid-test	43.92	22.78	30.85	18.90	33.46	19.45
Post-test	51.25	26.40	40.59	20.88	36.45	26.40
Maintenance Test	53.25	22.41	40.48	23.59	39.36	22.45
Student Perception of Ability Scale						
Pre-test	31.63	8.34	35.65	9.47	38.29	13.23
Mid-test	39.92	9.22	38.52	10.23	41.29	13.63
Post-test	38.79	11.39	39.35	10.54	39.82	14.25
Maintenance Test	40.54	11.88	39.35	11.61	37.59	14.79

Word Reading

The St Lucia Graded Word Reading Test (Andrews, 1973) was used to measure accuracy of reading words in isolation. This measure was used on each of the four testing occasions and results of repeated measures analyses of variance are shown in Table 3 below.

Table 3

Summary of Results of Group (2) x Occasion (4) Repeated Measures Analysis of Variance for St Lucia Accuracy Scores

Source of Variation	df	SS	MS	F	p
Conditions 1 & 2					
Between Subjects					
Group	1	950.22	950.22	3.37	.073
Error	47	13264.33	282.22		
Within Subjects					
Occasion	3	5178.03	1726.01	156.87	.001
Group x Occasion	3	241.34	80.45	7.31	.001
Error	141	1551.42	11.00		
Conditions 1 & 3					
Between Subjects					
Group	1	315.66	315.66	0.68	.413
Error	42	19433.54	426.70		
Within Subjects					
Occasion	3	5320.34	1773.45	143.96	.001
Group x Occasion	3	105.11	35.04	2.84	.040
Error	126	1552.17	12.32		
Conditions 2 & 3					
Between Subjects					
Group	1	130.72	130.72	.30	.587
Error	43	18752.89	436.11		
Within Subjects					
Occasion	3	3482.88	1160.96	110.84	.001
Group x Occasion	3	29.99	10.00	0.95	.416
Error	129	1351.15	10.47		

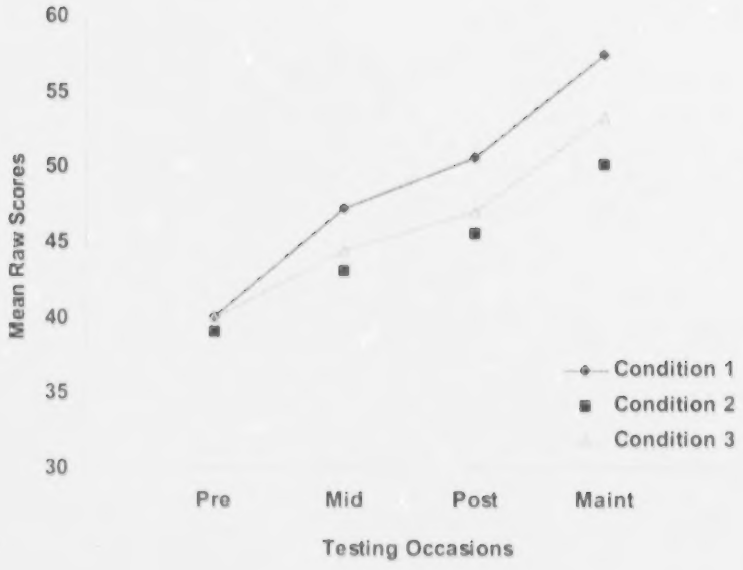
There were significant occasion main effects for each of the three experimental conditions, ($F(3,141) = 156.87$, $p<.001$ for Conditions One and Two; $F(3,126) = 143.96$, $p<.001$ for Conditions One and Three; and $F(3,129) = 110.84$, $p<.001$ for Conditions Two and Three). As shown in Figure 2 the mean raw scores of subjects in all conditions improved during the eight months which elapsed between the pre-test and the maintenance test.

There were also significant Group x Testing Occasion interactions which occurred between Condition One and Condition Two, $F(3,141) = 7.31$, $p<.001$; and between Condition One and Condition Three, $F(3,126) = 2.84$, $p<.05$. Univariate results revealed that in both instances these interactions were located in the contrast between the first and second testing occasions, $F(1,47) = 13.93$, $p<.001$; and $F(1,42) = 5.92$, $p<.05$, respectively. As revealed in the graph in Figure 2 the Condition One subjects, who had received the benefits 2of metacognitive training in word identification strategies from pre- to mid-test, showed greater improvement on mean raw scores during this time period than did the subjects in Condition Two or Condition Three who had received traditional instruction in word identification. In addition, the interaction between Conditions One and Two approached significance in the contrast between mid- and post-test, with subjects in Condition One continuing to show greater improvement than those in Condition Two between the mid- and post-testing occasions

The mean raw scores of the Condition One subjects improved approximately seven points from pre- to mid-test representing a mean improvement in word recognition reading age of approximately nine months during the two month period. During the same time period, the mean raw scores of the subjects in Conditions Two and Three each improved approximately four points, representing a mean improvement in reading age of approximately five months each. The mean rate of improvement for the Condition One subjects paralleled that of the other two Conditions for the remaining two testing occasions. During the entire intervention, subjects in Condition One showed a mean improvement of approximately 17 points, while subjects in Conditions Two and Three showed mean improvements of approximately 11 and 13 points, respectively. These results represented an improvement in mean word recognition reading age of approximately 22 months, 15 months, and 18 months for Conditions One, Two, and Three, respectively.

Figure 2

Mean raw scores of the three experimental conditions for the St Lucia Graded Word Reading Test across testing occasions



Metacognitive Abilities in Word Identification

The metacognitive abilities in word identification measures (Spedding & Chan, 1993, 1994) were taken on each of the four testing occasions, with parallel forms of the measure being used on each occasion. The results of repeated measures analyses of variance for each of the measures are shown in Table 4 below.

Table 4

Summary of Results of Group (2) x Occasion (4) Repeated Measures Analysis of Variance for Use of Metacognitive Cues in Word Identification

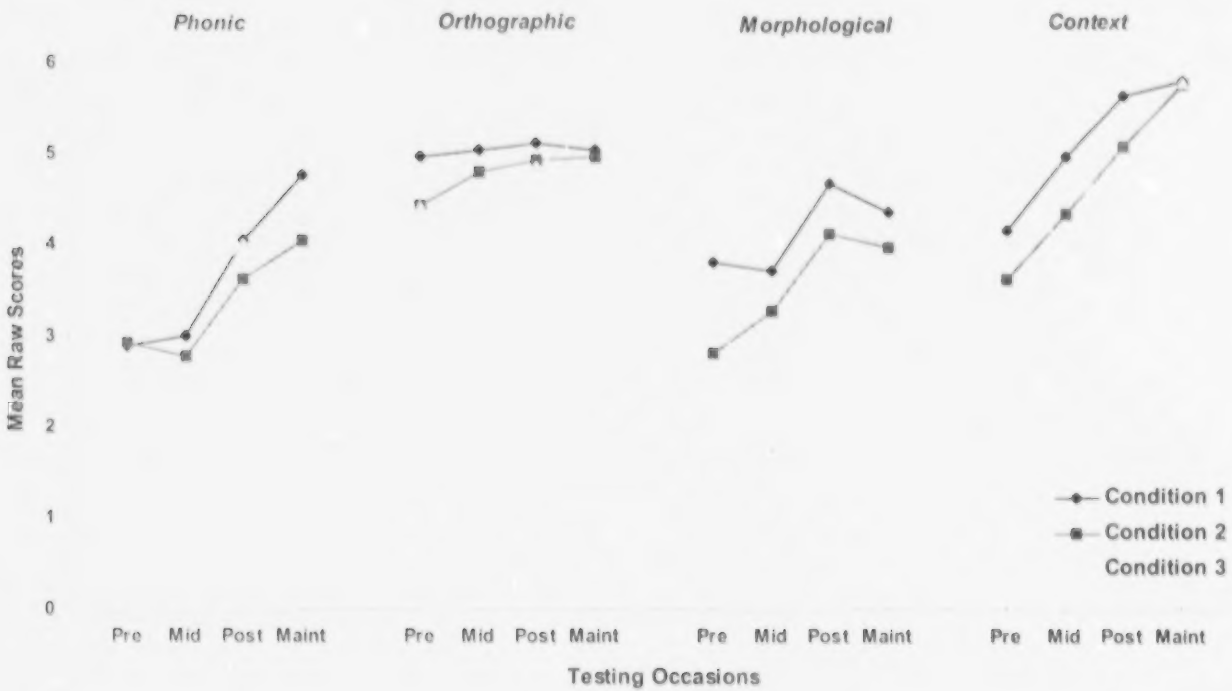
Source of Variation	df	SS	MS	F	p
Conditions 1 & 2					
Phonic Cues					
Between Subjects					
Group	1	5.67	5.67	0.96	.332
Error	49	289.93	5.91		
Within Subjects					
Occasion	3	84.26	28.09	18.02	.001
Group x Occasion	3	3.97	1.32	0.85	.467
Error	147	227.91	1.55		
Orthographic Cues					
Between Subjects					
Group	1	3.48	3.48	0.84	.364
Error	49	202.50	4.03		
Within Subjects					
Occasion	3	3.50	1.17	1.34	.265
Group x Occasion	3	1.46	0.49	0.56	.644
Error	147	128.21	0.87		
Morphological Cues					
Between Subjects					
Group	1	18.45	18.45	3.31	.075
Error	49	273.39	5.58		
Within Subjects					
Occasion	3	41.84	13.95	12.68	.001
Group x Occasion	3	2.78	0.93	0.84	.473
Error	147	161.62	1.10		
Context Cues					
Between Subjects					
Group	1	9.78	9.78	5.10	.028
Error	49	94.05	1.92		
Within Subjects					
Occasion	3	105.87	35.29	48.70	.001
Group x Occasion	3	2.85	0.95	1.31	.273
Error	147	106.53	0.72		
Conditions 1 & 3					
Phonic Cues					
Between Subjects					
Group	1	1.03	1.03	0.17	.678
Error	45	265.45	5.90		
Within Subjects					
Occasion	3	57.54	19.18	15.00	.001
Group x Occasion	3	10.48	3.49	2.73	.046
Error	135	172.62	1.28		
Orthographic Cues					
Between Subjects					
Group	1	4.25	4.25	1.33	.255
Error	45	144.07	3.20		
Within Subjects					
Occasion	3	7.06	2.35	2.81	.042
Group x Occasion	3	5.36	1.78	2.13	.099
Error	135	113.03	0.8		

Source of Variation	df	SS	MS	F	p
Morphological Cues					
Between Subjects					
Group	1	44.00	44.00	8.24	.006
Error	45	240.23	5.34		
Within Subjects					
Occasion	3	32.64	10.88	10.79	.001
Group x Occasion	3	1.62	0.54	0.54	.658
Error	135	136.14	1.01		
Context Cues					
Between Subjects					
Group	1	4.51	4.51	2.85	.098
Error	45	71.23	1.58		
Within Subjects					
Occasion	3	85.95	28.65	53.94	.001
Group x Occasion	3	3.95	1.32	2.48	.064
Error	135	71.71	0.53		
Conditions 2 & 3					
Phonic Cues					
Between Subjects					
Group	1	11.06	11.06	1.38	.246
Error	46	368.56	8.01		
Within Subjects					
Occasion	3	35.64	11.88	8.08	.001
Group x Occasion	3	1.81	0.60	0.41	.746
Error	138	202.92	1.47		
Orthographic Cues					
Between Subjects					
Group	1	0.07	0.07	0.01	.896
Error	46	205.92	4.48		
Within Subjects					
Occasion	3	13.66	4.55	4.80	.003
Group x Occasion	3	3.01	1.01	1.06	.368
Error	138	130.88	0.95		
Morphological Cues					
Between Subjects					
Group	1	6.46	6.46	1.07	.307
Error	46	278.54	6.06		
Within Subjects					
Occasion	3	38.78	12.93	11.13	.001
Group x Occasion	3	7.70	2.57	2.21	.090
Error	138	160.37	1.16		
Context Cues					
Between Subjects					
Group	1	0.78	0.78	0.31	.579
Error	46	114.20	2.48		
Within Subjects					
Occasion	3	110.76	36.92	52.44	.001
Group x Occasion	3	2.44	0.81	1.16	.329
Error	138	97.16	0.70		

There were significant occasion main effects for all but two of the measures. The exceptions were for the reported use of orthographic cues for Conditions One and Two. An examination of the graph in Figure 3 shows that subjects in each of the Conditions tended to make improved use of phonic, orthographic, and context cues for identifying unknown words, with each successive testing occasion. However, results for morphological cues tended to be inconsistent with a falling off in follow-up testing for all conditions. This falling away for all subjects may suggest a need for more intensive instruction in the use of morphological cues (affixes and root words) for identifying unknown words than was provided by the teachers in this study.

Figure 3

Mean raw scores of the three experimental conditions for use of metacognitive cues in word identification across testing occasions



While there were significant occasion main effects for nearly all measures, significant Group x Occasion interactions occurred for only one of the measures, both of which concerned the analysis between Conditions One and Three. A significant Group x Occasion interaction occurred between Conditions One and Three for the reported use of phonic cues in the identification of unknown words, $F(3,135) = 2.73$, $p<.05$. Univariate results revealed that this interaction was located in the contrast between the pre- and mid-test, $F(1,45) = 3.50$, $p=.07$. As shown in Figure 3, subjects in Condition One showed improved scores for this measure from pre- to mid-test while the subjects in Condition Three had a decrease in scores from pre- to mid-test. The general lack of significant interaction effects would suggest that teacher implementation of metacognitive word identification strategies was no more effective in developing metacognitive abilities in word identification than traditional methods of word identification.

Reading Comprehension

The Progressive Achievement Tests (PAT) in Reading Comprehension (Reid & Elley, 1986) were used as a measure of silent reading comprehension, with two parallel forms used in an A B A B testing sequence. Summaries of the results of repeated measures analyses of variance are shown in Table 5 below.

Table 5

Summary of Results of Group (2) x Occasion (4) Repeated Measures Analysis of Variance for PAT Comprehension Scores

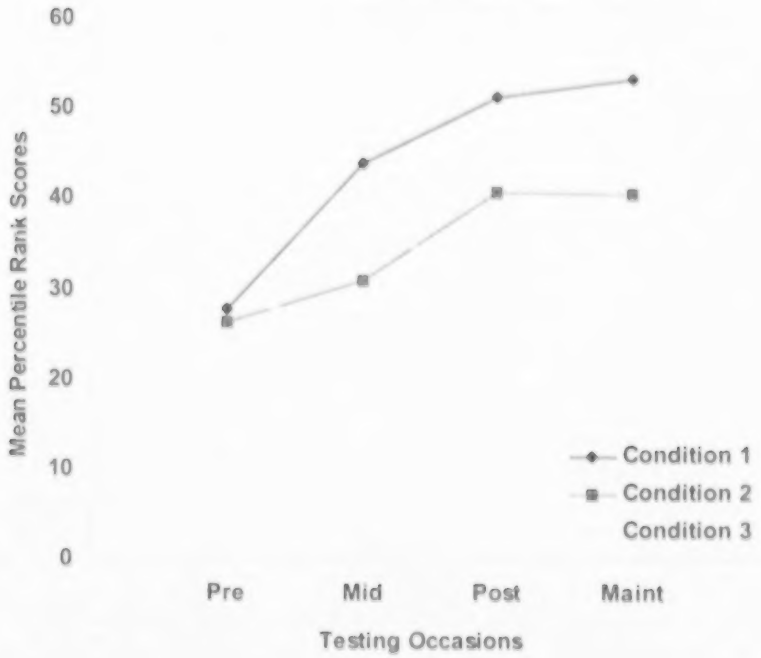
Source of Variation	df	SS	MS	F	p
Conditions 1 & 2					
Between Subjects					
Group	1	4571.19	4571.19	3.11	.084
Error	49	72029.81	1470.00		
Within Subjects					
Occasion	3	13082.49	4360.83	40.54	.001
Group x Occasion	3	1138.72	379.57	3.53	.017
Error	147	15811.69	107.56		
Conditions 1 & 3					
Between Subjects					
Group	1	5038.20	5038.20	3.38	.073
Error	44	65618.28	1491.32		
Within Subjects					
Occasion	3	10947.64	3649.21	26.48	.001
Group x Occasion	3	1031.47	343.82	2.49	.063
Error	132	18193.71	137.83		
Conditions 2 & 3					
Between Subjects					
Group	1	47.68	47.68	0.04	.849
Error	47	61349.17	1305.30		
Within Subjects					
Occasion	3	6307.62	2102.54	14.20	.001
Group x Occasion	3	278.07	92.69	0.63	.599
Error	141	20875.98	148.06		

Results for the analysis of the percentile rank scores on the PAT tests showed significant occasion main effects for all conditions, ($F(3,147) = 40.54$, $p<.001$ for Conditions One and Two; $F(3,132) = 26.48$, $p<.001$ for Conditions One and Three; $F(3,141) = 14.20$, $p<.001$ for Conditions Two and Three), indicating that significant improvement had occurred on the PAT percentile rank scores for all experimental conditions during the eight months of the study. Univariate results revealed that these significant improvements occurred during the first two training phases for each condition (pre-test to mid-test, and mid-test to post-test), but not during the final training phase (post-test to maintenance test).

There was also one significant Group x Occasion interaction and a second Group x Occasion interaction which approached significance. The significant Group x Occasion interaction occurred between Condition One and Condition Two, $F(3,147) = 3.53$, $p<.05$. Univariate results revealed that the interaction was located between the pre- and mid-testing occasion, $F(1,49) = 9.16$, $p<.01$. As shown in Figure 4, mean scores of the Condition One subjects increased more rapidly than those of the Condition Two subjects during this time period. The Group x Occasion interaction between Conditions One and Three also approached significance, $F(3,132) = 2.49$, $p<.07$. Once again univariate results suggested a significant interaction between the pre- and mid-testing occasions, $F(1,44) = 6.63$, $p<.05$, with the Condition One subjects showing more rapid improvement in mean scores than those in Condition Three, as indicated in the graph in Figure 4

Figure 4

Mean percentile rank scores of the three experimental conditions for the PAT silent reading comprehension across testing occasions



The mean percentile rank scores of the Condition One subjects improved approximately 16 points from pre- to mid-test. During the same time period, the mean percentile rank scores of the Condition Two subjects improved approximately five points, and those of Condition Three subjects improved approximately nine points. It was during this time period that subjects in Condition One received metacognitive instruction in word identification skills along with a modified form of reciprocal teaching. Subjects in Condition Two at this time received their normal classroom word study and normal comprehension activities, and subjects in Condition Three received training in reciprocal teaching of comprehension strategies along with traditional methods of word identification.

An inspection of Figure 4 reveals that subjects in Conditions Two and Three made approximately parallel rates of improvement during each phase of the intervention. After the initial significantly greater improvement between the pre- and mid-test, the rate of progress for subjects in Condition One tended to parallel that of the other two Conditions. During the entire intervention period there was an improvement in mean percentile rank scores of approximately 25 points for subjects in Condition One and approximately 14 points each for subjects in Conditions Two and Three. These scores suggest that the modified methods of metacognitive instruction used in this study for word attack and comprehension may give students an initial advantage which is likely to be maintained. It may also suggest that giving teachers full responsibility for the program is an important factor in improved reading comprehension as no significant interaction effects for silent reading comprehension were found when teachers took over responsibility for the program in an earlier study (Bruce & Robinson, 2000).

This improvement in reading comprehension scores for Condition One subjects parallels the improvement in word identification scores during the same time period. It would seem that as Condition One subjects became more proficient at word recognition, they might have been able to devote more of their attentional resources to comprehension of text (Näslund & Samuels, 1992; Perfetti, 1986; Spear-Swerling & Sternberg, 1994; Stanovich, 1986, 1992).

It should be noted however, that comprehension scores tended to plateau during the final maintenance phase, which may suggest that poor readers need ongoing, intensive support in reciprocal teaching procedures if they are to maintain significant rates of improvement. It may also suggest that poor readers need ongoing and intensive training in word identification strategies, so that continual significant improvements in word identification may allow for increasing attentional resources to be devoted to the comprehension strategies being targeted in the reciprocal teaching dialogue (Näslund & Samuels, 1992; Perfetti, 1986; Spear-Swerling & Sternberg, 1994; Stanovich, 1986, 1992).

Student's Perception of Ability Scale

The Student's Perception of Ability Scale (SPAS) (Boersma & Chapman, 1978; Chapman & Boersma, 1979) was used as a measure of changes in student academic self-concept. The measure was taken on each of the four testing occasions. The results of repeated measures analyses of variance are shown in Table 6 below.

Table 6

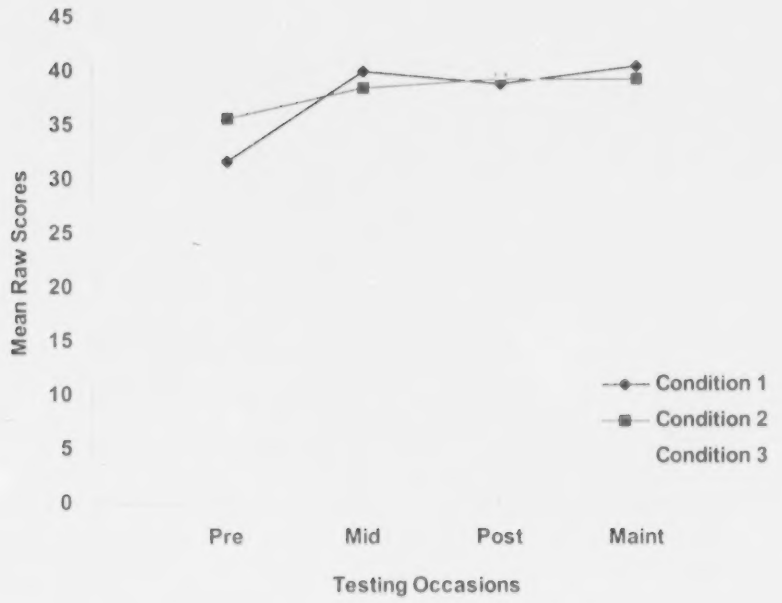
Summary of Results of Group (2) x Occasion (4) Repeated Measures Analysis of Variance for Student's Perception of Ability Scale (SPAS) Scores

Source of Variation	df	SS	MS	F	p
Conditions 1 & 2					
Between Subjects					
Group	1	11.68	11.68	0.03	.853
Error	45	15169.81	337.11		
Within Subjects					
Occasion	3	1194.70	398.23	12.48	.001
Group x Occasion	3	222.02	74.01	2.32	.078
Error	135	4306.96	31.90		
Conditions 1 & 3					
Between Subjects					
Group	1	93.33	93.33	0.20	.659
Error	39	18404.66	471.91		
Within Subjects					
Occasion	3	714.01	238.00	7.13	.001
Group x Occasion	3	465.55	155.18	4.65	.004
Error	117	3906.37	33.39		
Conditions 2 & 3					
Between Subjects					
Group	1	41.69	41.69	0.09	.772
Error	38	18588.15	489.16		
Within Subjects					
Occasion	3	206.25	68.75	2.16	.096
Group x Occasion	3	134.15	44.72	1.41	.245
Error	114	3624.89	31.80		

Results of the analysis showed significant occasion main effects for Conditions One and Two, $F(3,135) = 12.48$, $p<.001$, and Conditions One and Three, $F(3,117) = 7.13$, $p<.001$. Univariate results indicated that significant improvement occurred between the pre- and mid-testing occasions for both Conditions One and Two, $F(1,45) = 32.06$, $p<.001$, and Conditions One and Three, $F(1,39) = 16.09$, $p<.001$. In addition, occasion main effects for Conditions Two and Three approached significance, with univariate results showing a significant improvement from pre- to mid-test, $F(1,38) = 6.63$, $p<.05$. An inspection of the graph in Figure 5 suggests that the confidence of subjects in all three conditions improved during the first phase of the intervention and then levelled out during the remaining phases. While some levelling out occurred, the significant improvement in self-concept is consistent with research indicating a reciprocal relationship between school success and academic self-concept (Coley & Hoffman, 1990; Kurtz-Costes & Schneider, 1994; Obiakor & Algozzine, 1997).

Figure 5

Mean raw scores of the three experimental conditions in Study Three on the Student's Perception of Ability Scale (SPAS) across testing occasions



There was also a significant Group x Occasion interaction between Condition One and Condition Three, $F(3,117) = 4.65$, $p<.01$. Univariate results revealed that this interaction occurred between the first and second testing occasions, $F(1,39) = 8.55$, $p<.01$. As shown in Figure 5, subjects in Condition One had considerably lower mean Self Perception of Ability scores at the beginning of the intervention than did those in Condition Three. However, by the time of the mid-test, the mean scores for the two groups were similar. The Group x Occasion interaction between Conditions One and Two also approached significance. Once again univariate results suggested a significant interaction between the pre- and mid-testing occasions, $F(1,45) = 5.32$, $p.< .05$, with the Condition One subjects showing a more rapid improvement in mean scores than those in Condition Two as reflected in the graph in Figure 5.

SUMMARY OF FINDINGS

Effectiveness of the program

The implication of these results for each of the three research questions will now be discussed more fully.

Research question one firstly involved gauging the extent to which the metacognitive word identification program would improve both metacognitive abilities in word

identification and general word recognition skills of a group of upper primary poor readers. Results showed significant improvements for each of these measures, which provides further support for the underlying importance of metacognitive abilities in word identification in the development of proficient word identification skills (Spedding & Chan, 1993, 1994).

The fact that subjects in Conditions Two and Three, who did not receive metacognitive word identification training, made almost as much progress in claimed use of metacognitive abilities as subjects in Condition One, is in contrast to the results in a previous study (Bruce & Robinson, 2000) which were clearly in favour of those receiving the metacognitive word identification training. In the previous study, however, metacognitive abilities in word identification were measured at only the pre- and mid-testing occasions. Further testing at the close of the interventions may have shown fewer differences between the experimental and control groups in these studies. In addition, school-based personnel may not have been as effective at emphasising metacognitive awareness and monitoring of word identification strategies as was the experimenter. This would be consistent with research indicating that many teachers experience difficulty in adopting a more strategic approach to teaching without ongoing collegial coaching and support (Anderson & Roit, 1993; Gersten & Brengelman, 1996; Pressley & El-Dinary, 1997; Vaughn, Kligner, & Hughes, 2000; Wong, 1997).

The daily attention to word study provided in Conditions Two and Three may have also contributed to students' growing metacognitive abilities in word identification as well as their significant improvement in word identification skills. Research into best instructional practices in word recognition and word identification for learning disabled students suggests that any direct or indirect word study (McCormick & Becker, 1996), along with sufficient exposure to print to allow specific words and subword representations to become permanently remembered (Adams, 1990; Cunningham & Stanovich, 1990; Ehri, 1999; Ehri & McCormick, 1998; McCormick, 1994), will lead to reading improvements for these students.

The second part of research question involved comparing the effectiveness of a metacognitive approach to teaching word identification skills with the effectiveness of a traditional approach to teaching unfamiliar words to a group of upper primary poor readers. The metacognitive instruction in word identification strategies had a greater facilitative effect on students' word recognition abilities than did either regular classroom-based word study instruction (Condition Two) or the use of traditional methods of teaching word identification skills during the reciprocal teaching program (Condition Three), as found in a previous study (Bruce & Robinson, 2000). These results suggest that the daily exposure to word pronunciations and meanings which occurred in the traditional teaching process enabled these students to improve their word recognition performance (McCormick & Becker, 1996). However, the results for Condition One demonstrate the greater facilitative effect of the metacognitive word identification intervention strategies in the pre- to mid-test phase (Gaskins et al., 1996-1997; Lenz & Hughes, 1990; Lovett, Miller et al., 2000; Thompson & Taymans, 1994). It was during this phase that such strategies were used most intensively.

The slowing of rate of improvement in word recognition scores for the Condition One subjects after the mid-testing occasion, was also a pattern consistent with the previous study. At this time, instruction in metacognitive word identification strategies became less intensive, being only part of the clarification process in the reciprocal teaching

procedures. Even though it was observed that the teachers concerned did cue students to use the Clever Kid's Cues where appropriate, improvement in word recognition performance was not so rapid once intensive instruction in metacognitive word identification strategies was withdrawn. This result may reflect the need for ongoing and intensive metacognitive strategy instruction if poor readers are to gain automaticity and fluency in word identification (Felton, 1993; Gaskins et al., 1996-1997; Spear-Swerling & Sternberg, 1994), especially those who enter the program with a number of "roadblocks" to success such as maladaptive cognitive styles, poor self-concepts, attitudes of learned helplessness, and poor home support (Gaskins, 1998; Spear-Swerling & Sternberg, 1994; Wong, 1991).

The third part of research question one involved comparison of the effectiveness of a program involving a metacognitive approach to teaching word identification skills combined with reciprocal teaching of comprehension skills, with that of a program focusing only on reciprocal teaching of comprehension skills and using the traditional approach to identifying unfamiliar words. Once again, all groups improved but there was more improvement for subjects in Condition One, who received the combined package of word identification skills and reciprocal teaching of comprehension skills. These results suggest that the intervention methods used in each of the three conditions were effective for improving the comprehension skills of the poor readers in this study. This is an important finding in view of a critical review of the research by Rosenshine and Meister (1994) which reported that students with poor decoding and comprehension skills (i.e., the subjects of this study) were less likely to gain significant benefits from reciprocal teaching interventions than students whose problems were related to comprehension alone and not decoding ability. These were the type of students selected for intervention in the original reciprocal teaching research (Palincsar, 1987; Palincsar & Brown, 1984). Rosenshine and Meister (1994) found that when readers with poor decoding and comprehension skills were tested with standardised tests, as opposed to experimenter-developed tests, these tests usually yielded non-significant results.

As each intervention method also resulted in improved word identification scores, it could be implied that one of the reasons for significant improvements in comprehension for the poor readers in this study was improvement in lower-order word processing skills. As indicated earlier, increased proficiency at the word level has been claimed to allow students to devote more attentional resources to higher order cognitive processes (Näslund & Samuels, 1992; Perfetti, 1986; Spear-Swerling & Sternberg, 1994; Stanovich, 1986, 1992).

When metacognitive instruction in word identification strategies was combined with reciprocal teaching of comprehension strategies (Condition One) rates of improvement were greater. This result suggests that specific metacognitive instruction in word identification strategies can significantly enhance the effectiveness of reciprocal teaching procedures for poor readers in comparison to reciprocal teaching combined with traditional methods of word identification. This conclusion receives support from the fact that the greatest rate of improvement for subjects in Condition One occurred during the first phase of the study when students were receiving intensive metacognitive instruction in word identification strategies.

The similar improvements in mean comprehension scores for subjects in Conditions Two and Three suggest that the longer time period devoted to reciprocal teaching procedures

in Condition Three, was no more effective for improving comprehension than normal classroom word study/comprehension activities and a shorter reciprocal teaching intervention (Condition Two). These results support claims by Palincsar (1987) that twenty days of intervention followed by weekly booster sessions are usually sufficient for gaining and maintaining improvement from reciprocal teaching procedures. The plateau in the maintenance phase for comprehension, however, may suggest the need for ongoing, intensive support in both word identification strategies and reciprocal teaching procedures if poor readers are to maintain significant rates of improvement. Even though subjects in all conditions had made significant improvements in word identification by the time of the maintenance test, there was still a discrepancy between mean chronological and word recognition reading ages of approximately 14 months for Condition One, 20 months for Condition Two, and 17 months for Condition Three, indicating that their decoding abilities were still below grade level, and that they had not yet reached the stage of automaticity in word identification which would allow full cognitive resources to be devoted to higher order processes (Näslund & Samuels, 1992; Perfetti, 1986; Spear-Swerling & Sternberg, 1994; Stanovich, 1986, 1992). This would be consistent with evidence that reciprocal teaching works best for those students for whom it was originally intended, ie, students who are adequate decoders but poor comprehenders (Kligner & Vaughn, 1996; Moore, 1988; Rosenshine & Meister, 1994; Palincsar & Brown, 1984). However, the facilitative effects of the combined metacognitive word identification and reciprocal teaching program during phase one for subjects in Condition One, suggests that an ongoing, intensive program of this type may enable poor readers to maintain significant rates of improvement in both word identification and comprehension scores.

Implementation of the program in the regular classroom

A number of findings and implications arise out of the three major aims for implementing the program in the regular classroom.

The *first aim* was to examine the effectiveness of a model for implementation of the program by the regular teacher in the classroom setting. In the previous study (Bruce & Robinson, 2000), the experimenter initially set up the program and then the class teachers gradually assumed responsibility for its implementation. However, there was little evidence that teachers continued to use metacognitive strategies when given the responsibility. In this study, class teachers or resource personnel within the school were responsible for implementation of the entire program. The services of the experimenter were required only for the initial explanation and modelling of the procedures, and for monitoring of lessons in the early stages to check for fidelity of treatment.

The significant occasion main effects for most measures in this study clearly show that the program could be successfully implemented using school-based personnel, without the need for ongoing instruction by the experimenter or any person from outside the school system. Furthermore, as reported earlier, similar results were obtained whether the poor readers were taught by the classroom teacher, the resource teacher, or a teacher's aide. This result suggests that a variety of school-based personnel may be trained to implement the program effectively.

A *second aim* of this study was to examine the effects of the model on poor readers only. In the previous study (Bruce & Robinson, 2000) normally-achieving readers were included in the training procedures as it was felt that the combination of group support,

shared expertise and the role models which they provided in the reciprocal teaching dialogue would facilitate the use of the strategies by the poor readers (Brown & Palincsar, 1989; Palincsar & Brown, 1988; Palincsar, David, Winn, & Stevens, 1991). However, most teachers in the previous study found it easier to cater for all class members by conducting whole class rather than small group sessions. This meant that the poor readers were often overshadowed by their more dominant normally-achieving peers, and therefore had less opportunity for participation in the interactive dialogue. Also, in the whole class situation, some teachers tended to control the dialogue rather than allowing pupils to develop in their role as *teacher*. This may have been the reason why most of the significant results in the previous study occurred in the experimenter-led, rather than the teacher-led, phase of the study.

The frequent significant occasion main effects in each phase of the intervention implied that poor readers could benefit when training was directed solely at them. For example, univariate results showed occasion main effects for the St Lucia (Andrews, 1973) word recognition scores for each of the conditions on all of the testing occasions. The PAT comprehension (Reid & Elley, 1986) univariate results showed significant occasion main effects on the mid-test and post-testing occasions, although not on the maintenance test. For the metacognitive abilities in word identification measure (Spedding & Chan, 1993, 1994) there were occasion main effects for most of the cues on most of the testing occasions. The fact that subjects continued to show improvement throughout the intervention may have been because they had more opportunity for participation in the interactive dialogue in the small group situation, as advocated by Palincsar (1986, 1987) and Palincsar and Brown (1986, 1988). Another contributing factor may have been that students felt more comfortable participating with classmates of similar ability, rather than with classmates of greater competence (Gottlieb, 1984). These factors may have been enhanced by the cyclic effects of improved word identification for facilitating comprehension of text, both through more reliable use of context cues for recognition of unfamiliar words (Foorman, Francis, Fletcher, & Lynn, 1996; Henshaw, 1992; Nicholson, 1991; Pratt, Kemp, & Martin, 1996; Stanovich, 1986, 1993-1994; Stanovich & Siegel, 1994; Yeu & Goetz, 1994), and through increased automaticity allowing greater cognitive resources to be devoted to construction of meaning (Näslund & Samuels, 1992; Samuels, Schermer, & Reinking,1992; Shankweiler, 1989; Stanovich, 1986, 1992).

Organisational factors may also have contributed to the more successful implementation for poor readers only. It was easier for teachers in Study Three to provide special instruction for only the poor reader group, especially as they had the option of either teaching the group themselves (while the rest of the clas worked on independent reading activities), or using the services of a resource teacher or teacher's aide to teach the small group while they taught the rest of the class. In the previous study (Bruce & Robinson, 2000), this support was not available, and most teachers found it difficult to organise reciprocal teaching dialogues for all of their reading groups, so they resorted to whole class instruction. In this situation, poor readers were often overshadowed by their more dominant normally-achieving peers, which highlights some of the difficulties and challenges of translating research into classroom practice (Gersten & Brengelman, 1996; Pressley & El-Dinary, 1997; Scruggs & Mastropieri, 1996; Stanovich & Stanovich, 1997; Vaughn et al., 2000).

The *third aim* of Study Three was to assess methods of creating interest in the metacognitive word identification segment of the program. As discussed previously, it had been observed in a previous study (Bruce & Robinson, 2000) that many students

lost interest after several weeks of the metacognitive word identification activities. Instruction in oral reading alone did not seem sufficient to maintain interest and attention for these pupils, and it was not until the reciprocal teaching of comprehension segment was introduced that their interest was reactivated. In an attempt to maintain student interest throughout the intervention it was decided to introduce reciprocal teaching of comprehension skills in a modified form along with the initial instruction in metacognitive word identification strategies during the first phase of this study. Discussion with the teachers or assistants involved confirmed that student motivation was maintained during the word identification segment of the program, which suggests that methods developed to create interest were effective, which is consistent with reported evidence of the highly motivated nature of reciprocal teaching procedures (Palincsar, 1987; Palincsar, Ransom, & Derber, 1988-1989; Palincsar & Klenk, 1992; Speece et al., 1997). This could have been reflected in the initially greater gains in self perception of ability for Condition One on the SPAS (Boersma & Chapman, 1978; Chapman & Boersma, 1979), as shown in Figure 5. The reported greater motivation may also be reflected in the significant increases in reading age on the St Lucia (Andrews, 1973), especially in Phase One (see Figure 2), and by significant improvements in use of phonic cues and justification for the use of morphological cues in word identification (Spedding & Chan, 1993, 1994) during Phase One (see Figure 3). The increased motivation may have also influenced comprehension, with significant gains in phase one on the PAT (Reid & Elley, 1986) being maintained during Phases Two and Three (see Figure 4).

CONCLUSION

While metacognitive research (both laboratory and classroom-based) has provided valuable insights into effective methods for improving the comprehension of poor readers, there has been little parallel research into metacognitive approaches to teaching word identification skills. This study has suggested that a metacognitive word identification and reciprocal teaching program can be successfully undertaken by school-based personnel, but such a classroom-based model is more successful when teachers have responsibility for its implementation from the beginning. This may have been because teachers who had entire responsibility felt a greater *ownership* of the program, leading to more faithful implementation of each of its components (Coley et al., 1993; Gersten & Brengelman, 1996; Giangreco, Edelman, Luiselli, & MacFarland, 1997; Malouf & Schiller, 1995; Marks et al., 1993).

There were, however, a number of limitations and questions which arise from the results of this project which could be the basis of future research. First, subject samples were drawn from a limited urban to semi-urban area of the NSW (Australia) coast. Replication in other areas would help add validity to the results.

There was also a restriction to the amount of coaching and modelling which the experimenter was able to provide for teachers. Teachers may need a great deal of coaching, modelling and support if they are to adopt a style of teaching which promotes metacognitive awareness and monitoring of strategies (Carnine, 1997; Gersten & Brengleman, 1996; Pressley & El-Dinary, 1997; Wong, 1997). A greater degree of collaborative support may also allow teachers to explore a variety of options for implementation, including ways of effectively providing strategy instruction for the whole class so that all pupils may benefit. Future research in this area could include investigations into the effectiveness of peer tutoring and cooperative learning groups for teaching both the word identification strategies and the reciprocal teaching of

comprehension. It should be mentioned, however, that despite the restricted coaching and modelling time, teachers in Study Three indicated that they were happy with the progress made by their poor readers as a result of the intervention.

Questions also remain as to the optimal length of the intervention. In Study Three, when teachers were responsible for implementation of the program, there was a levelling off of improvements during the final phase of the study, especially for comprehension. Future research could explore whether increased time devoted to the first phase of the study, i.e., intensive word identification strategy instruction, plus a modified form of reciprocal teaching, would lead to continued significant improvements in comprehension. It may be that more time devoted to increasing fluency in word identification in a format which children find motivating (i.e., combined with modified reciprocal teaching), would lead to more effective and efficient benefits when reciprocal teaching is more fully implemented at a later stage. This seemed to be the case in an earlier study, when experimental subjects, who had the benefit of instruction in metacognitive word identification strategies prior to reciprocal teaching of comprehension, made just as rapid gains in silent reading comprehension after a few weeks of reciprocal teaching, as had the control subjects who received reciprocal teaching with traditional methods of word identification throughout the intervention.

A related question concerns the impact of age and prior experience on the effectiveness of the program. Results for a number of the measures indicated that Year 5 subjects did not make as much progress as those in Year 6. It may be that younger students require a longer and more intensive intervention, in order to make the same progress as Year 6 subjects. Further research could explore the effectiveness of the program for varying age groups, e.g., middle primary school (Years 3 and 4) and lower secondary school (Years 7 and 8), along with the length of intervention required for the maximum benefit for each of these levels.

Reciprocal teaching of comprehension skills and metacognitive approaches to teaching word identification skills have been identified as effective tools in the search for methods to assist children with reading difficulties. This study has helped verify their value and has shown that they can be effectively implemented in regular class situations. More study is needed, however, of the nature of modifications necessary for effective implementation in the regular class, the optimum length of intervention and the most effective model for teacher training.

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